OPTIMUS RAD Product Planning Data

Contents

1. PRODUCT INFORMATION

1.1. HISTORY OF DOCUMENT

Document is confirm the requirements of the PRD guidelines.

Text	Remark added in position 4. For the reason of new software release 3.5 general update of text.
Z-1.1	page No. changed from Z-1 to Z-1.1
Z-1.2	page No. changed from Z-2 to Z-1.2
Z-1.3	page No. changed from Z-5 to Z-1.3
Z-6.1	page No. changed from Z-3 to Z-6.1
Z-7.1 and Z-7.3	internal correction
Z-7.2	connection added in section bucky /tomo
Z-7.4	correction to the earth points
Z-7.10	page No. changed from Z-20.1 to Z-7.10

1.2. INTRODUCTION

The Optimus family of generators for radiography is based on computer–controlled converter technology.
The converter operates in the non–audible frequency range.
Applicable options are essentially achieved by releasing software modules using customized PAL ICs.
Control between the internal **F**unction **U**nits (FUs) and the external online equipment takes place by a CAN bus.
Safety–relevant signals are transferred directly on the so–called „Signal bus“.
Units without any CAN interface are operated by the “Adapter for 4 auxiliary units WA“ option.

1.3. APPLICATIONS

- Radiography
- Tomography

1.4. OPTIONS

Component overview according to the commercial catalogue.
Only the versions in the current commercial catalogue can be ordered.
If an existing generator is to be upgraded the commercial department must order:

MGR0011 (upgrade of an existing configuration)
\+ MGRxxxx
\+ S/N

1.4.1. HARDWARE OPTIONS + MGR0011 + S/N

- Low–speed rotor control	9890 000 0220x	
- Dual–speed rotor control	9890 000 0268x	MGR2082
- Mains transformer PDU: 400 - 480V; 50 / 60Hz, also for 400V mains supply without neutral lead N with taps for 400 / 440 / 460 / 480V	9890 000 0230x	
- Mains transformer: 190-390V; 50 / 60Hz with taps for 190 / 200 / 207 / 220 / 230 / 240 / 250 / 343 / 380 / 390V **max. 50kW!**	9803 720 8100x	
- Adapter for 4 aux. units WA	9890 000 0231x	MGR2131
- Option rack	9890 000 0232x	
- Extension set for one additional tube	9890 000 0234x	
- Tube extension WG	9890 000 0238x	
- Operating panel	9890 000 0240x	
- Operating module Optimus	9890 000 0278x	
- Operating desk data cable 10m, 20m, 30m	9890 000 0241x / 2x / 3x	
- Stand for operating panel	9890 000 0244x	MGR1482
- Wall mounting of operating panel	9890 000 0245x	
- 26VDC / 230VAC adapter	9890 000 0246x	MGR2281
- Surge arrester WN	9890 000 0247x	
- Handswitch for Optimus	9890 000 0249x	
- **P**atient **D**ata **O**rganizer (PDO)	9890 000 0255x	MGR2091
- Decade cable set 14 x 4m top decade --> AMP decade	9803 704 2010x	
- APR extension	9890 000 0257x	
- Extension photo pick-up Optimus	9890 000 0258x	

1.4.2. SOFTWARE OPTIONS + MGR0011 + S/N

Software options are provided by a function key.
Additional hardware components are not required.

- **A**utomatic **E**xposure **C**ontrol (**AEC**)	9890 000 0281x [1)]	MGR2171
- **A**natomic **P**rogrammed **R**adiography / **F**luorography (**APR**/**F**)	9890 000 0282x [1)]	MGR2181
- Automatic **T**omo **T**ime **I**nput (**TTI**)	9890 000 0222x	MGR2122
- **T**omo **D**ensity **C**ontrol (**TDC**)	9890 000 0223x	MGR2122
- VARIOFOCUS	9890 000 0227x	MGR2101
- Area dose calculator	9890 000 0256x	MGR2141

1) = Options only for base 9890 000 0218x
Options are always included in base 9890 000 0216x

2. COMPATIBILITY

2.1. GENERATOR COMPONENTS

-	Base OPTIMUS		9890 000 0218x	
-	H.V. transformer	1 tube, 50kW	9890 000 0203x	
-	H.V. transformer	2 tubes, 50kW	9890 000 0204x	MGR2051 (Upgrade 1 --> 2) tubes
-	H.V. transformer	1 tube, 65 / 80kW	9890 000 0205x.	
-	H.V. transformer	2 tubes, 65 / 80kW	9890 000 0206x	MGR2052 (Upgrade 1 --> 2) tubes
-	50kW extension - RAD		9890 000 0262x	
-	65kW extension - RAD		9890 000 0263x	
-	80kW extension - RAD		9890 000 0264x	
-	Converter		9890 000 0277x	
-	Firmware Rel. 3.5		9890 000 0251x	

2.2. TUBES

Recommended standard tubes:
- RO 17 50
- SRO 25 50
- SRO 33 100

Further compatible tubes:

- RO 30	- SRO 09 51	- SRO 22 50
- RO 12 30	- SRO 13 30	- SRO 25 51
- RO 1648	- SRO 20 50	- SRO 32 100
- RO 3050	- SRO 20 55	- SRO 33 102

Compatible tube housings:
- ROT 350
- ROT 351

The latest information on further tubes which are connectable is available at the service center Hamburg.

NOTE

When the generator is retrofitted it is important to use the screened cable 3 x 1.31mm^2 (0722 215 02054) as the stator cable.
If necessary exchange the old stator cable.

3. MECHANICAL DATA

Crate / Box 1 **-** Generator cabinet - Operating panel - Cables	**Dimension (mm)**			**Weight (Newton)** (10N = 1Kg)
	Length	Width	Height	
Packed	840	820	2100	226
Transport	N / A	N / A	N / A	N / A
Installed	550	585	1965	178

Crate / Box 2 - H.V. generator	**Dimension (mm)**			**Weight (Newton)** (10N = 1Kg)
	Length	Width	Height	
Packed	800	670	770	1-tube version: 100 2-tube version: 115
Transport	N / A	N / A	N / A	N / A
Installed	550	585	1965	1-tube version: 73 2-tube version: 88

4. ENVIRONMENTAL DATA

The environmental data comply with PMS standard UXW 13600.
Class S0 - Dedicated mains supply, 3 phases and neutral. Thus single phase voltage is also available.
A low impedance, permanently installed connection, fed in by the step down transformer of the hospital to supply large systems like in MR, CT and X-ray departments is required.

NOTE

Use always a mains cable with 4 wires and concentric PE-shield, type NYCY.

	Operation	**Stock / Transport**
Temperature in °**Celcius**	+10 / + 40	- 40 / + 75
Temperature in °**Celcius / hour**	N / A	N / A
Humidity in % (non-condensing)	15 / 90	15 / 90
Gradient in % **/ hour**	N / A	N / A
Vibrations / Shock range in **Hz**	5 - 500	5 - 500
Vibrations / Shock amplitude in **mm**	N / A	N / A
Vibrations / Shock acceleration in **g**	0.25 peak	1.0 peak
Shock acceleration in **g**	5 peak	30 peak
Shock pulse duration in **msec**	11	11
Air pressure in **Hecto-pascal**	700 / 1100	700 / 1100

Acoustic noise level : max. 40dBA; average per hour
Air cooling : max. 500 W; average per hour
EMC : IEC 950

To avoid any possible annoying noise of the implemented fans it is advisable to install the generator cabinet outside the examination room.

5. ELECTRICAL DATA

5.1. POWER DATA AND MAINS CONDITIONS

	Voltage		
	50kW	**65kW**	**80kW**
Mains voltage	3 x 400V ±10% (≅ 415V $^{+6\%}$ / 380V $_{-5\%}$)		
	3 x 400 / 440 / 460V ±10% *		
	3 x 480V $^{+6\%}\vert_{-10\%}$ *		
	3 x 190 ... 343V ±10% **		
	* = with internal mains transformer (option) ** = with external mains transformer; max. 50kW (option)		

	Frequency		
	50kW	**65kW**	**80kW**
Mains frequency	49 ... 61Hz		

	Max. mains current		
Voltage	**50kW**	**65kW**	**80kW**
400V	145A	190A	230A
440V	135A	180A	215A
460V	125A	170A	210A
480V	120A	160A	205A
190V	300A	-	-
Fuse protection (slow blow)	35A	50A	
	100A at ≤ 240V	-	-

Voltage	Mains resistance		
	50kW	65kW	80kW
400V	≤ 300mΩ	≤ 200mΩ	
440V	≤ 350mΩ	≤ 240mΩ	
460V	≤ 350mΩ	≤ 240mΩ	
480V	≤ 400mΩ	≤ 300mΩ	
480V valid for DOD only	≤ 300mΩ	≤ 240mΩ	≤ 180mΩ
	Note *500mΩ is the **absolute max.** mains resistance.*		

5.2. POWER SUPPLY FOR APPLICATIONS

	Generator power		
	50kW	65kW	80kW
Max. output power	230V / 400V; max. 5A		

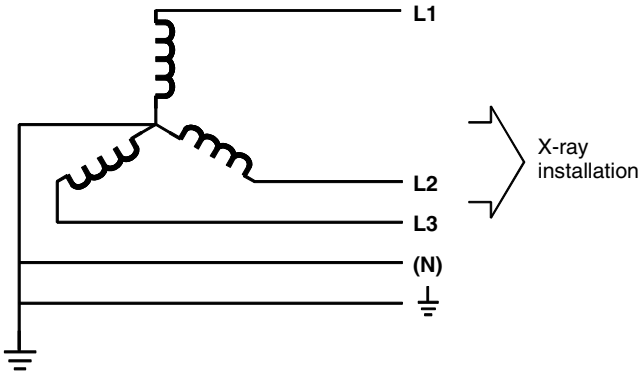
5.3. OPERATING DATA

Data		Generator power		
		50kW	65kW	80kW
Exposure:	Tube current	1 ... 650mA	1 ... 900mA	1 ... 1100mA
	Tube voltage	40 ... 150kV in kV- or %-steps		
	mAs product	0,5 ... 850mAs		
	Exposure time	1ms ... 6s / 16s		
	Exposure frequency	≤ 12exp./s		
	Interfacing option for	door contact, external radiation warning indicator		

5.4. POWER SUPPLY

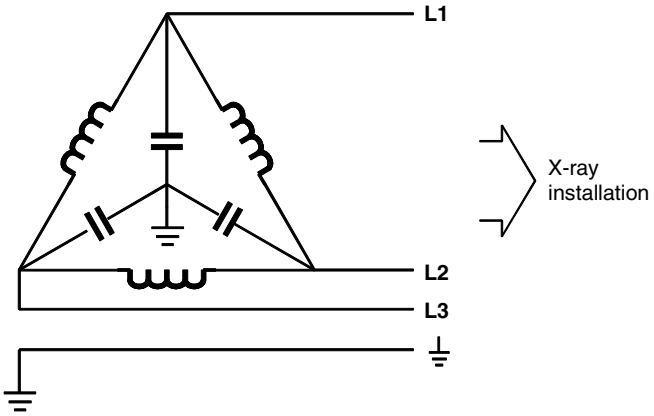
5.4.1. TYPE OF POWER SUPPLY

3 phase WYE



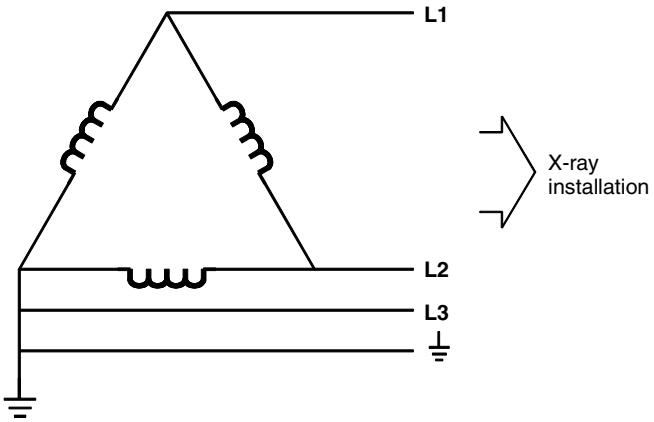
- 400V
- 440V / 460V / 480V with external mains transformer 4512 204 0010x.
- Surge arrester WN is required if the mains transformer 9890 000 0230x is ordered.
- Neutral not required if the external mains transformer 4512 204 0010x is ordered.
- 190V ... 343V with external mains transformer 9803 720 8100x (max. 50kW).

3 phase DELTA, balanced earth or floating



- Mains transformer 4512 204 0010x is required.
- 400V / 440V / 460V / 480V
- Surge arrester WN is required.
- 190V ... 343V with external mains transformer 9803 720 8100x (max. 50kW). Works only together with the internal mains transformer.

3 phase DELTA, grounded



- Mains transformer 4512 204 0010x is required.
- 400V / 440V / 460V / 480V
- Surge arrester WN is required (requires modification at the EMC-filter of the kV power unit).
- 190V ... 343V with external mains transformer 9803 720 8100x (max. 50kW). Works only together with the internal mains transformer.

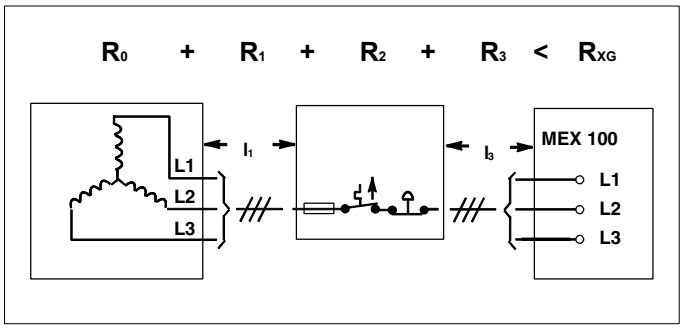
Caution!
Ensure the sequence of phases in the wall junction box corresponds to designations L1, L2, L3.

5.4.2. CALCULATING THE MAINS RESISTANCES

NOTE

The cross section of lead l_3 must not exceed 25mm^2.

If possible the sum of R_0, R_1, R_2 and R_3 should be smaller than the R_{XG} requires.
With higher internal mains resistances the generator output is reduced correspondingly.



R_0 designates the mains resistance of the distributor transformer

R_1 depends on the length of lead l_1 between distributor transformer and mains distributor and on the selected cross section as well:
==> $R_1 = l_1 \times R_{Cu}$ R_{Cu} from table below

R_2 consists of upstream elements such as:
- Emergency–OFF switch 4.0mΩ
- Earth–leakage circuit breaker 5.5mΩ
- Fuse 5.5mΩ
- Surge arrester WN 23.0mΩ

R_3 depends on the length of lead l_3 between mains distributor and wall junction box and on the selected cross section as well:
==> $R_3 = l_3 \times R_{Cu}$ R_{Cu} from table below

The resistances consider the go and return lines so that the calculation can be based on simple cable lengths.

Copper cross section [mm^2]	Resistance R_{Cu} [mΩ/m]
16	2.19
25	1.4
35	1.0
50	0.7
70	0.5
95	0.38
120	0.30
150	0.24

NOTE

*500mΩ is the **absolute max.** mains resistance.*

5.4.3. EARTH–LEAKAGE CIRCUIT BREAKER

To be provided between mains fuse and X–ray installation depending on local regulations.

Siemens earth–leakage circuit breaker:

- Order No.: 5SZ3 466 OKG00
- Rated fault current 30mA
- Rated current 63A
- Connection terminals for wire cross sections of up to 25mm^2

5.4.4. EMERGENCY-OFF DEVICE

To be provided depending on local regulations.

There are 2 possibilities:

1. All the Emergency-OFF buttons are connected in series and looped into the switch-ON circuit (12VDC) of the generator.

2. The Emergency-OFF circuit acts on an external mains contactor which switches OFF the power before it is fed into the generator.

6. TOOLS REQUIRED

- Service engineer standard tool kit
- Service–PC:IBM–compatible, 640kB RAM, 3.5“ floppy disk drive, ≥ 1 serial port
- Installation and service software 4512 116 022xx / 023xx:Supplied on two floppy disks within this generator service manual.
- PC–hardkey (DIAGGEN):Necessary to carry out the installation and to run the service software (special programmings, fault finding).
- 0–modem cable: Minimum length is distance between generator cabinet and operating desk.
  Male 25–pole D–Sub connector at the generator side.
  A 5m data cable of bucky controller can be used: 4512 130 56931
- Mains resistance measuring instrument
- Dose measuring instrument
- mAs-meter
- Multimeter
- Digital oscilloscope with 2–beam memory
- Recommended PLCC extraction tool (AMP 822154-1): 2422 487 89772

7. TRACEABLE ITEMS

The following items have serial numbers of the following format when delivered ex factory:

- Generator cabinet : 6 digit serial number
- H.V. tank : 7 digit serial number
- Operating desk : 8 digit serial number

8. PREPARATION

8.1. INSTALLATION MATERIAL

To be ordered from the service departement of PMS Hamburg:

- Wall junction box: 4512 103 7538x
  inclusive connection block (25mm^2) for mains supply and connection block (10mm^2) for unit supply.

- Relay for radiation warning indicator: 4512 100 4523x
  1 interface relay with a floating contact (230V/1A) is included in the scope of delivery of the generator.

8.2. CABLES

H.V. cables

with O3 / O3 plugs:	9806 402 6xx02
length:	6m - 30m in steps of 2m
capacity:	155pF/m
diameter:	16.5mm

The cable length is indicated by the 9th and 10th digit of the numeric code.

Thermal contact cable

- 2–wire screened for 1 excess temperature switch	4512 100 66151
- 10–wire screened for additional supervision like temperature alarm switch, buzzer, selection indicator	0722 215 19005

Stator cable

3 x 1.3mm^2, screened	0722 215 02054

AMPLIMAT cable
with D–Sub and 3-Plus plug:

12m	9890 000 01721
16m	9890 000 01731
20m	9890 000 01741
24m	9890 000 01751

CAUTION

AMPLIMAT cables 9803 507 0xx02 (for hybrid measuring chambers 9803 509 xxxxx) with 3-Plus plugs at both ends must be connected in the generator by the following adapter for each cable:

Adapter for AMPLIMAT cable: 4512 108 09042. The generator includes 1 adapter.

The hybrid measuring chambers 9803 509 xxxxx require connection (chassis) between contacts:
D-Sub end GND (13) <---> RF 0V (8) (generator input)
or
3-Plus end GND (N) <---> RF 0V (J) (generator input)

This connection is established by the adapter for the AMPLIMAT cable.
See Z1 “Basic interface“ of the generator manual.

In case a hybrid measuring chamber 9803 509 xxxxx is **not** operated with the required
AMPLIMAT cable 3-Plus / 3-Plus 9803 507 0xx02
but with
AMPLIMAT cable D-Sub / 3-Plus 9890 000 017xx
make sure to establish this connection (13 <---> 8) in the D-Sub connector!

For ALC measuring chambers 9890 000 016xx connection GND <---> RF 0V is not permitted.
Therefore, ALC measuring chambers AMPLIMAT cables 9890 000 017xx should always be used.

Operating desk

NOTE

Use the shortest cables. Noise immunity increases.

cable set	10m	9890 000 02411
	20m	9890 000 02421
	30m	9890 000 02431

8.3. MANPOWER

At least two persons are necessary to insert the H.V. tank (weight about 110kg) in the generator cabinet.

9. NETWORK DATA

N/A

10. REMOTE SERVICE DATA

N/A

11. TRANSPORT DATA

N/A

12. PRE-INSTALLATION REQUIREMENTS

12.1. ROOM PREPARATION DONE BY CUSTOMER

- Providing mains power
- Installation of mains fuse
- Mounting of cable duct

12.2. ROOM PREPARATION DONE BY SSD / SSR

- Mounting of wall connection box
- Measuring of mains resistance

13. PRE-INSTALLATION DATA

N/A

14. DOWNLOADS AND DRAWINGS

To download the text file in Word format click: 451298200922_010.doc
*Z-1.1, Z-1.2, Z-7.1 and Z-7.3 are from 451298200921
*Z-1.3 and Z-6.1 are from 451298200991
*Z-7.10 is from 451298200101

	Description	**View (PDF)**	**Download**	
			u-Station zipped	**AutoCad zipped**
	3D Model	N / A	N / A	N / A
*Z-1.1	Generator Cabinet Mechanical dimensions	Z-1.1.pdf(01.0)	Z-1.1.dgn(01.0)	Z-1.1.dwg(01.0)
*Z-1.2	Room Layout	Z-1.2.pdf(01.0)	Z-1.2.dgn(01.0)	Z-1.2.dwg(01.0)
*Z-1.3	Operating panel Mechanical dimensions	Z-1.3.pdf(01.0)	Z-1.3.dgn(01.0)	Z-1.3.dwg(01.0)
*Z-6.1	Connection of generator	Z-6.1.pdf(01.0)	Z-6.1.dgn(01.0)	Z-6.1.dwg(01.0)
*Z-7.1	OPTIMUS RAD Connection diagram	Z-7.1.pdf(01.0)	Z-7.1.dgn(01.0)	Z-7.1.dwg(01.0)
Z-7.2	OPTIMUS RAD Connection diagram	Z-7.2.pdf(01.0)	Z-7.2.dgn(01.0)	Z-7.2.dwg(01.0)
*Z-7.3	OPTIMUS RAD Connection diagram	Z-7.3.pdf(01.0)	Z-7.3.dgn(01.0)	Z-7.3.dwg(01.0)
Z-7.4	OPTIMUS RAD Connection diagram	Z-7.4.pdf(01.0)	Z-7.4.dgn(01.0)	Z-7.4.dwg(01.0)
*Z-7.10	OPTIMUS RAD Connection diagram	Z-7.10.pdf(01.0)	Z-7.10.dgn(01.0)	Z-7.10.dwg(01.0)